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C L A I M S

What is claimed is:

1. A molecular marker that distinguishes a *Frk2* gene originating from *Lycopersicon*  
*esculentum* as opposed to a *Frk2* gene originating from a wild *Lycopersicon* species, said marker  
5 being a marker for increased fructose/glucose ratio in tomato fruit as compared to a ratio  
generally present in standard tomato cultivars.
2. A molecular marker for a gene linked to *Frk2* having a wild-species derived allele, whose  
wild species-derived allele increases fructose to glucose ratio in mature tomato fruit as compared  
to a ratio generally present in standard tomato cultivars.
- 10 3. A molecular marker according to claim 2 wherein said marker is part of the *Frk2* gene.
4. A molecular marker that, upon interaction with another marker that tags a *Fgr* locus  
located on tomato chromosome number 4, is a marker for increased fructose/glucose ratio in  
tomato fruit as compared to a ratio generally present in standard tomato cultivars.
5. A molecular marker according to claim 1 that distinguishes a *Frk2* gene originating from  
15 *Lycopersicon esculentum* as opposed to a *Frk2* gene originating from *Lycopersicon hirsutum*.
6. A marker according to claim 1 and further comprising an amplification product generated  
by a primers called F2F and F2R that are further digested with *EcoR* I endonuclease, comprising  
a nucleotide sequence:

F2F= CGCCCGCTGAGTTGAATCTTGATCTT, and

20 F2R= CACAAGGACATGGCGGATTCATCATC.

7. A marker according to claim 6 and further comprising a fragment having a nucleotide  
sequence as follows:

1 CATGGCAGTT AACGGTGCTT CTTCTCTGG TTTGATCGTC AGTTTCGGTG AGATGTTGAT  
25 61 CGATTTCGTT CCGACAGTCT CCGGCGTATC CCTTGCCGAG GCTCCCGGAT TTTTGAAAGC  
121 TCCCGGCGGT GCACCGGCGA ACGTCGCTAT CGCGGTGACG AGGCTCGGAG GGAGGTCGGC  
181 GTTCGTCGGG AAACTCGGCG ACGATGAGTT CGGTCACATG CTCGCCGGGA TTCTGAAAAC  
30 241 GAACGGCGTA CAAGCCGATG GAATCAATTT TGACAAGGGC GCCAGGACGG CTTTGCGGTT  
301 CGTGACTCTA CGCGCCGACG GAGAGCGTGA GTTTATGTTT TACAGAAATC CCAGTGCCGA  
361 TATGTTGCTC ACGCCCGCTG AGTTGAATCT TGATCTTATT AGATCTGCTA AGGTGTTCCA  
421 CTATGGATCA ATTAGTTTGA TCGTGGAGCC ATGTAGAGCA GCACATATGA AGGCAATGGA  
481 AGTAGCTAAG GAGGCAGGGG CATTGCTCTC TTATGACCCT AACCTTCGTT TGCCGTTGTG  
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541 GCCTTCAGCA GAAGAAGCCA AGAAGCAAAT CAAGAGCATA TGGGACTCTG CTGATGTGAT  
601 CAAGGTCAGC GATGTGGAGC TCGAATTCCT CACTGGAAGC AACAAGATTG ATGATGAATC  
5 661 CGCCATGTCC TTGTGGCATC CTAACCTGAA GCTACTCTTG GTCACTCTTG GTGAAAAGGG  
721 TTGCAATTAC TACACCAAGA AATTCCATGG AACCGTTGGA GGATTCCATG TGAAGACTGT  
781 TGACACCACT GGAGCTGGTG ATTCTTTTGT TGGTGCCCTT CTAACCAAGA TTGTTGATGA  
10 841 TCAAACCATT CTCGACGATG AAGCAAGGTT GAAGGAAGTA CTTAGGTTTT CATGTGCATG  
901 TGGAGCCATC ACTACAACCA AGAAAGGAGC AATCCCAGCT TTGCCTACTG CATCTGAAGC  
15 961 CCTCACTTTG CTCAAGGGAG GAGCATAGAA ACATCATGTT ATCTTTTTTC TTTTTTCCAT  
1021 CTTCATATAT TTCCCCCCT TTATGAGTTT TTTTAACTT TGAAGCTAGT AGGAAGCCTT

8. A marker according to claim 6 and further comprising a fragment having an amino acid  
20 sequence as follows:

MAVNGASSSGLIVSFGEMLIDFVPTVSGVSLAEAPGFLKAPGGAPANVAIAVTRLGG  
RSAFVGKLGDDFEGHMLAGILKTNGVQADGINFDKGARTALAFVTLRADGEREFMF  
YRNPSADMILLTPAELNLDLIRSAKVPHYGSISLIVEPCRAAHMKAMEVAKEAGALLS  
25 YDPNLRPLWPAAEEAKKQIKSIWDSADVIKVSDELEFLTGSNKIDDESAMSLWHP  
NLKLLLVTLGEKGCNYYTKKFHGTVGGFHVKTVDTTGAGDSFVGALLTKIVDDQTI  
LDDEARLKEVLRFCACGAITTTKKGAIPALPTASEALTLLKGG

9. A method for breeding tomato plants that produce tomatoes having superior taste  
30 characteristics, comprising the steps of:

crossing at least one *Lycopersicon esculentum* plant with a *Lycopersicon* spp. to produce  
hybrid seeds;

collecting the hybrid ( $F_1$ ) seeds;

growing plants from the  $F_1$  seeds;

35 pollinating the  $F_1$  plants;

collecting the hybrid seeds produced by the  $F_1$  plants;

growing plants from the seeds produced by the  $F_1$  plants;

measuring glucose and fructose content of ripe fruit produced from the plants grown from

the seeds of the F<sub>1</sub> plants;

providing a marker that distinguishes a *Frk2* gene originating from *Lycopersicon esculentum* as opposed to a *Frk2* gene originating from a wild *Lycopersicon* species, said marker being a marker for increased fructose/glucose ratio in tomato fruit; and

5 using said at least one additional marker to select a tomato plant with tomato fruit having desired characteristics including a fructose to glucose ratio greater than a ratio of standard *Lycopersicon esculentum*.

10. A method for finding a gene that produce tomatoes having superior taste characteristics, comprising the steps of:

10 providing a marker that distinguishes a *Frk2* gene originating from *Lycopersicon esculentum* as opposed to a *Frk2* gene originating from a wild *Lycopersicon* species, said marker being a marker for increased fructose/glucose ratio in tomato fruit; and

using said at least one additional marker to find said gene.

11. A method for finding a promoter region of a gene that produce tomatoes having superior  
15 taste characteristics, comprising the steps of:

providing a marker that distinguishes a *Frk2* gene originating from *Lycopersicon esculentum* as opposed to a *Frk2* gene originating from a wild *Lycopersicon* species, said marker being a marker for increased fructose/glucose ratio in tomato fruit; and

using said at least one additional marker to find a promoter region of said gene.

20 12. A method according to claim 10 and further comprising cloning said gene.

13. A method according to claims 9 and additionally comprising the step of propagating said plants with tomato fruits having the desired characteristics.

14. A method according to claim 13 wherein the step of propagating includes the step of vegetative propagation.

25 15. A method according to claim 13 wherein the step of propagating includes the step of propagation by seed.

16. A tomato plant produced according to the method of claim 9.

17. A tomato fruit produced by a tomato plant in accordance with claim 16.

18. A tomato seed which when grown yield a tomato plant in accordance with claim 16.